ROBINSON & COLE LLP

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
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kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

October 24, 2012

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **EM-VER-158-111214 – Bayberry Lane, Westport, Connecticut**
EM-VER-033-120620 – 201 Main Street, Cromwell, Connecticut
EM-VER-155-120615 – 570 New Park Avenue, West Hartford, Connecticut
EM-VER-151-120802 – 940 Meriden Road, Waterbury, Connecticut
EM-VER-110-120806 – 335 Washington Street, Plainville, Connecticut
EM-VER-011-120525 – 811 Blue Hills Avenue, Bloomfield, Connecticut
EM-VER-017-120904 – 1191 Terryville Avenue, Bristol, Connecticut
EM-VER-155-120829 – 3114 Albany Avenue, West Hartford, Connecticut

Completion of Construction Activity

Dear Ms. Roberts:

The purpose of this letter is to notify the Siting Council that construction activity associated with the above-referenced Cellco Partnership d/b/a Verizon Wireless telecommunications facility modifications has been completed.

If you have any questions or need any additional information regarding this facility please do not hesitate to contact me.

Sincerely,

Kenneth C. Baldwin

Copy to:
Sandy M. Carter

11801779-v1

STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

July 9, 2012

Kenneth C. Baldwin, Esq.
Robinson & Cole LLP
280 Trumbull Street
Hartford, CT 06103

RE: **EM-VER-155-120615-** Cellco Partnership d/b/a Verizon Wireless notice of intent to modify an existing telecommunications facility located at 570 New Park Avenue, West Hartford, Connecticut.

Dear Attorney Baldwin:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated June 14, 2012. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/CDM/jbw

c: The Honorable Scott Slifka, Mayor, Town of West Hartford
Barry M. Feldman, Town Manager, Town of West Hartford
Mila Limson, Town Planner, Town of West Hartford
Crown Castle

ROBINSON & COLE

EM-VER-155-120615

KENNETH C. BALDWIN

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June 14, 2012

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

Re: **Notice of Exempt Modification – Antenna Swap**
570 New Park Avenue, West Hartford, Connecticut

Dear Ms. Roberts:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) wireless telecommunications antennas at the 147-foot level of the existing 150-foot tower at the above-referenced address. The tower is owned by Crown Castle. The Council approved Cellco's use of this tower in 1990 (Docket No. 131). Cellco now intends to replace all of its existing antennas with six (6) model LPA-80063-6CF cellular antennas; two (2) model BXA-171063-12BF PCS antennas; one (1) model BXA-171063-8BF PCS antenna; and three (3) model BXA-70063-6CF LTE antennas, all at the same 147-foot level. Cellco also intends to install six (6) additional coax cables inside the monopole. Attached behind Tab 1 are the specifications for the replacement antennas.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to Ronald Van Winkle, Town Manager for the Town of West Hartford. A copy of this letter is also being sent to 570 New Park LLC, the owner of the property on which the tower is located.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing tower. Cellco's replacement antennas will be located at the 147-foot level on the 150-foot tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundaries.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more.

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) adopted safety standard. A cumulative power density table for Cellco's modified facility is included behind Tab 2.

Also attached is a Structural Analysis Report confirming that the tower and foundation can support Cellco's proposed modifications. (See Tab 3).

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
Ronald Van Winkle, West Hartford Town Manager
570 New Park LLC
Sandy M. Carter

Amphenol ANTENNA SOLUTIONS

LPA-80063-6CF-EDIN-X

V-Pol | Log Periodic | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

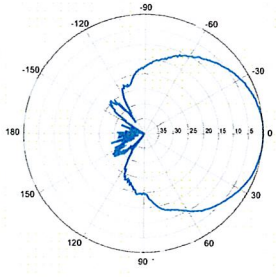
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	
Frequency bands	806-960 MHz
Polarization	Vertical
Horizontal beamwidth	63°
Vertical beamwidth	10°
Gain	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 4, 5, 6, 8, 10
Impedance	50Ω
VSWR	≤1.4:1
Null fill	5% (-26.02 dB)
Input power	500 W
Lightning protection	Direct Ground
Connector(s)	1 Port / EDIN or NE / Female / Center (Back)

Mechanical Characteristics		
Dimensions Length x Width x Depth	1805 x 385 x 332 mm	71.1 x 15.2 x 13.1 in
Depth of antenna with z-bracket	372 mm	14.6 in
Weight without mounting brackets	12.3 kg	27 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.70 m² Side: 0.59 m²	Front: 7.5 ft² Side: 6.3 ft²
Wind load @ 161 km/hr (100 mph)	Front: 885 N Side: 757 N	Front: 199 lbf Side: 170 lbf

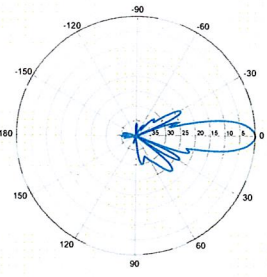
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit (0-20°)	21700000	50-102 mm 2.0-4.0 in	11 kg 25 lbs
Lock-Down Brace	If the lock-down brace is used, the maximum diameter of the mounting pipe is 88.9 mm or 3.5 in.		

LPA-80063-6CF-EDIN-X



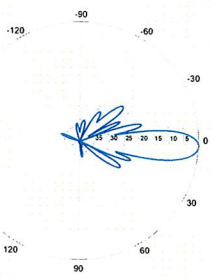
Horizontal

LPA-80063-6CF-EDIN-0



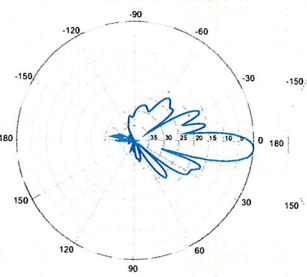
0° | Vertical

LPA-80063-6CF-EDIN-2



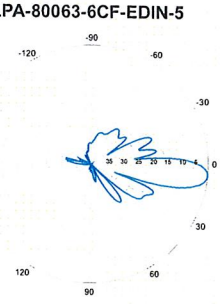
2° | Vertical

LPA-80063-6CF-EDIN-4



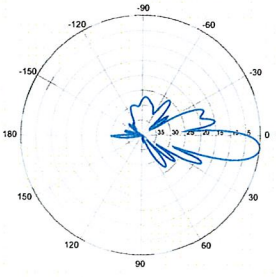
4° | Vertical

LPA-80063-6CF-EDIN-5



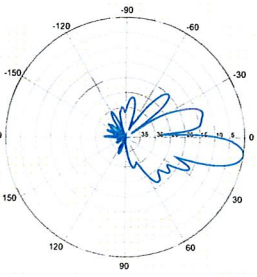
5° | Vertical

LPA-80063-6CF-EDIN-6



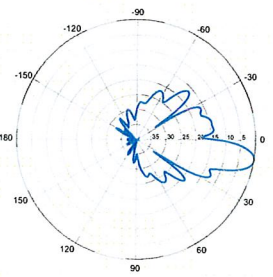
6° | Vertical

LPA-80063-6CF-EDIN-8



8° | Vertical

LPA-80063-6CF-EDIN-10



10° | Vertical

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

Amphenol ANTENNA SOLUTIONS

BXA-171063-12BF-EDIN-X

Replace "X" with desired electrical downtilt.

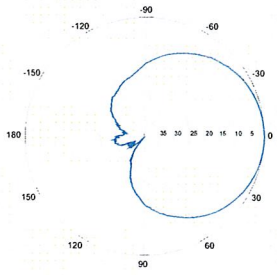
X-Pol | FET Panel | 63° | 19.0 dBi

Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	4.5°	4.5°	4.5°
Gain	16.1 dBd / 18.2 dBi	16.5 dBd / 18.6 dBi	16.9 dBd / 19.0 dBi
Electrical downtilt (X)	0, 2, 5		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back ratio	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1820 x 154 x 105 mm	71.7 x 6.1 x 4.1 in
Depth with z-brackets	133 mm	5.2 in
Weight without mounting brackets	6.8 kg	15 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.28 m² Side: 0.19 m²	Front: 3.1 ft² Side: 2.1 ft²
Wind load @ 161 km/hr (100 mph)	Front: 460 N Side: 304 N	Front: 103 lbf Side: 68 lbf

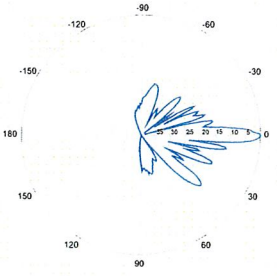
Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-12BF-EDIN-X-FP		

BXA-171063-12BF-EDIN-X



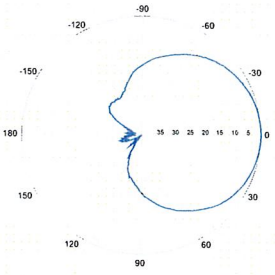
Horizontal | 1710-1880 MHz

BXA-171063-12BF-EDIN-0



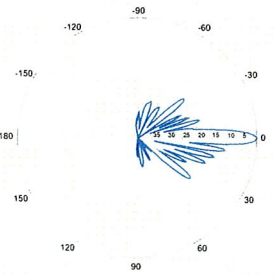
0° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-X



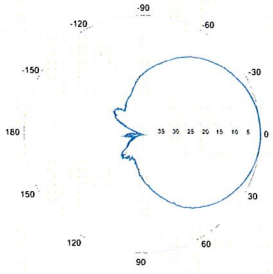
Horizontal | 1850-1990 MHz

BXA-171063-12BF-EDIN-0



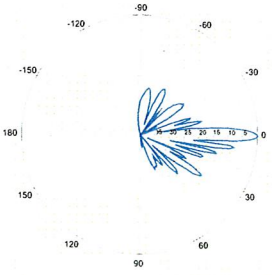
0° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-X



Horizontal | 1920-2170 MHz

BXA-171063-12BF-EDIN-0



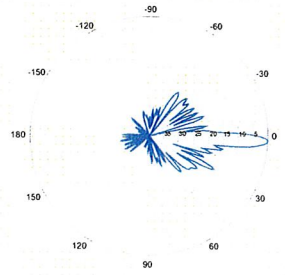
0° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-12BF-EDIN-X

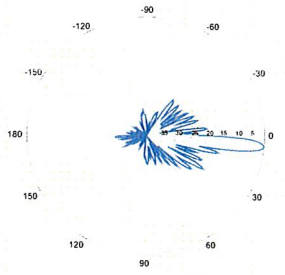
X-Pol | FET Panel | 63° | 19.0 dBi

BXA-171063-12BF-EDIN-2



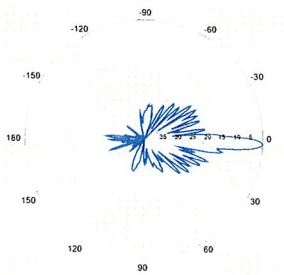
2° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-5



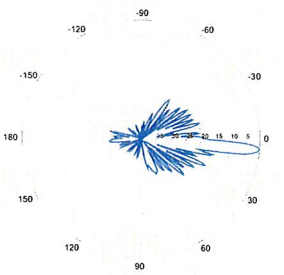
5° | Vertical | 1710-1880 MHz

BXA-171063-12BF-EDIN-2



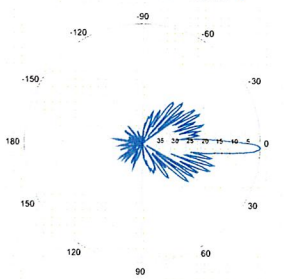
2° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-5



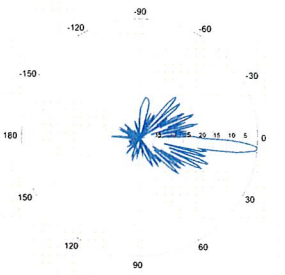
5° | Vertical | 1850-1990 MHz

BXA-171063-12BF-EDIN-2



2° | Vertical | 1920-2170 MHz

BXA-171063-12BF-EDIN-5



5° | Vertical | 1920-2170 MHz

BXA-171063-8BF-EDIN-X

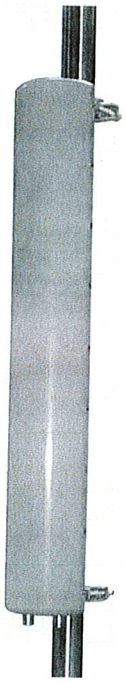
Replace "X" with desired electrical downtilt.

X-Pol | FET Panel | 63° | 17.4 dBi

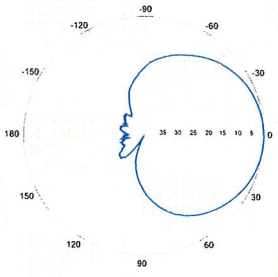
Electrical Characteristics	1710-2170 MHz		
Frequency bands	1710-1880 MHz	1850-1990 MHz	1920-2170 MHz
Polarization	±45°	±45°	±45°
Horizontal beamwidth	68°	65°	60°
Vertical beamwidth	7°	7°	7°
Gain	14.5 dBd / 16.6 dBi	14.9 dBd / 17.0 dBi	15.3 dBd / 17.4 dBi
Electrical downtilt (X)	0, 2, 4, 8		
Impedance	50Ω		
VSWR	≤1.5:1		
First upper sidelobe	< -17 dB		
Front-to-back isolation	> 30 dB		
In-band isolation	> 28 dB		
IM3 (20W carrier)	< -150 dBc		
Input power	300 W		
Lightning protection	Direct Ground		
Connector(s)	2 Ports / EDIN / Female / Bottom		
Operating temperature	-40° to +60° C / -40° to +140° F		

Mechanical Characteristics		
Dimensions Length x Width x Depth	1232 x 154 x 105 mm	48.5 x 6.1 x 4.1 in
Depth with t-brackets	133 mm	5.2 in
Weight without mounting brackets	4.8 kg	10.5 lbs
Survival wind speed	296 km/hr	184 mph
Wind area	Front: 0.19 m² Side: 0.14 m²	Front: 2.0 ft² Side: 1.5 ft²
Wind load @ 161 km/hr (100 mph)	Front: 281 N Side: 223 N	Front: 63 lbf Side: 50 lbf

Mounting Options	Part Number	Fits Pipe Diameter	Weight
2-Point Mounting Bracket Kit	26799997	50-102 mm 2.0-4.0 in	2.3 kg 5 lbs
2-Point Mounting & Downtilt Bracket Kit	26799999	50-102 mm 2.0-4.0 in	3.6 kg 8 lbs
Concealment Configurations	For concealment configurations, order BXA-171063-8BF-EDIN-X-FP		

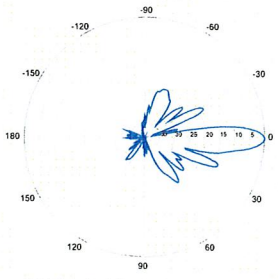


BXA-171063-8BF-EDIN-X



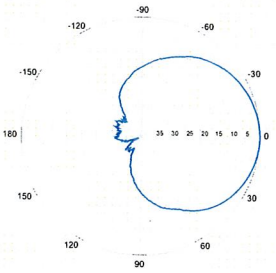
Horizontal | 1710-1880 MHz

BXA-171063-8BF-EDIN-0



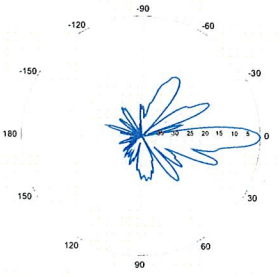
0° | Vertical | 1710-1880 MHz

BXA-171063-8BF-EDIN-X



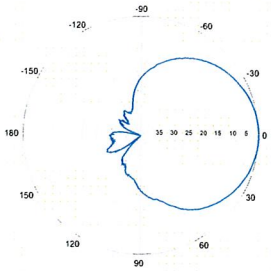
Horizontal | 1850-1990 MHz

BXA-171063-8BF-EDIN-0



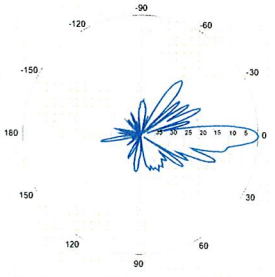
0° | Vertical | 1850-1990 MHz

BXA-171063-8BF-EDIN-X



Horizontal | 1920-2170 MHz

BXA-171063-8BF-EDIN-0



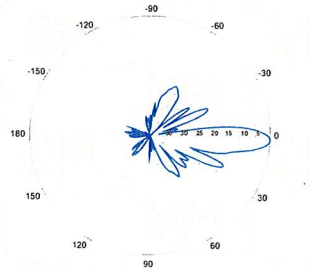
0° | Vertical | 1920-2170 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

BXA-171063-8BF-EDIN-X

X-Pol | FET Panel | 63° | 17.4 dBi

BXA-171063-8BF-EDIN-2



2° | Vertical | 1710-1880 MHz

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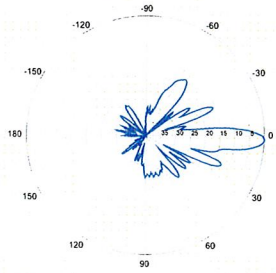

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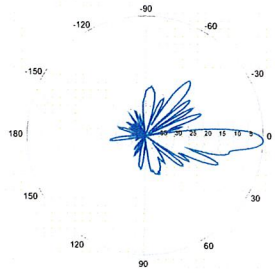

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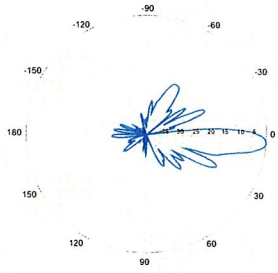

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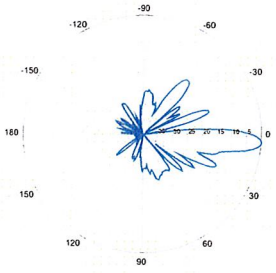

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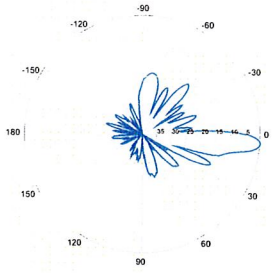

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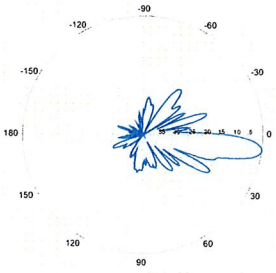

8° | Vertical | 1710-1880 MHz

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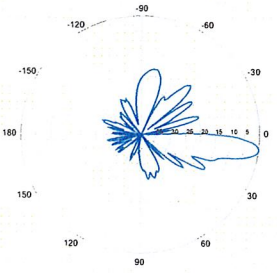

8° | Vertical | 1850-1990 MHz

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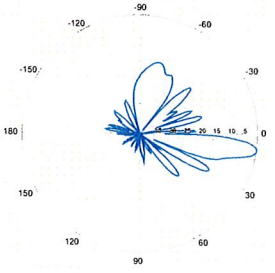


8° | Vertical | 1920-2170 MHz

Amphenol ANTENNA SOLUTIONS

BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

Replace "X" with desired electrical downtilt.

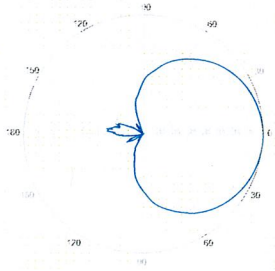
Antenna is also available with NE connector(s). Replace "EDIN" with "NE" in the model number when ordering.

Electrical Characteristics	696-900 MHz	
Frequency bands	696-806 MHz	806-900 MHz
Polarization	±45°	
Horizontal beamwidth	65°	63°
Vertical beamwidth	13°	11°
Gain	14.0 dBd (16.1 dBi)	14.5 dBd (16.6 dBi)
Electrical downtilt (X)	0, 2, 3, 4, 5, 6, 8, 10	
Impedance	50Ω	
VSWR	≤1.35:1	
Upper sidelobe suppression (0°)	-18.3 dB	-18.2 dB
Front-to-back ratio (+/-30°)	-33.4 dB	-36.3 dB
Null fill	5% (-26.02 dB)	
Isolation between ports	< -25 dB	
Input power with EDIN connectors	500 W	
Input power with NE connectors	300 W	
Lightning protection	Direct Ground	
Connector(s)	2 Ports / EDIN or NE / Female / Center (Back)	

Mechanical Characteristics		
Dimensions Length x Width x Depth	1804 x 285 x 132 mm	71.0 x 11.2 x 5.2 in
Depth with z-brackets	172 mm	6.8 in
Weight without mounting brackets	7.9 kg	17 lbs
Survival wind speed	> 201 km/hr	> 125 mph
Wind area	Front: 0.51 m² Side: 0.24 m²	Front: 5.5 ft² Side: 2.6 ft²
Wind load @ 161 km/hr (100 mph)	Front: 759 N Side: 391 N	Front: 169 lbf Side: 89 lbf

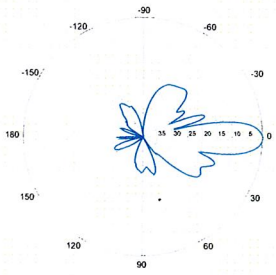
Mounting Options	Part Number	Fits Pipe Diameter	Weight
3-Point Mounting & Downtilt Bracket Kit	36210008	40-115 mm 1.57-4.5 in	6.9 kg 15.2 lbs
Concealment Configurations	For concealment configurations, order BXA-70063-6CF-EDIN-X-FP		

BXA-70063-6CF-EDIN-X



Horizontal | 750 MHz

BXA-70063-6CF-EDIN-0



0° | Vertical | 750 MHz

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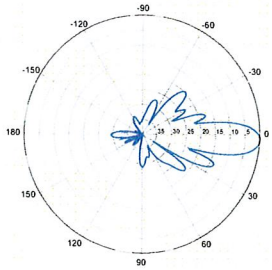
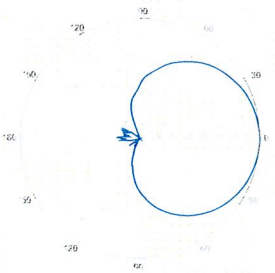
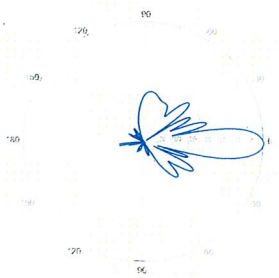


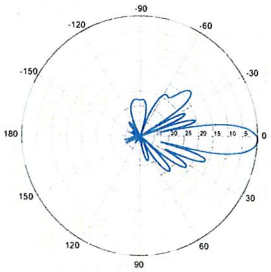
2° | Vertical | 750 MHz



Horizontal | 850 MHz



0° | Vertical | 850 MHz



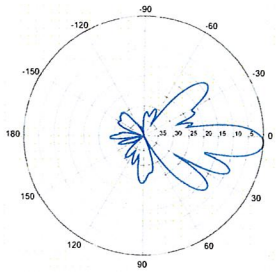
2° | Vertical | 850 MHz

Quoted performance parameters are provided to offer typical or range values only and may vary as a result of normal manufacturing and operational conditions. Extreme operational conditions and/or stress on structural supports is beyond our control. Such conditions may result in damage to this product. Improvements to product may be made without notice.

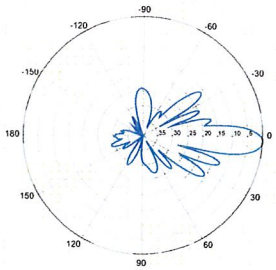
BXA-70063-6CF-EDIN-X

X-Pol | FET Panel | 63° | 14.5 dBd

BXA-70063-6CF-EDIN-3



3° | Vertical | 750 MHz



3° | Vertical | 850 MHz

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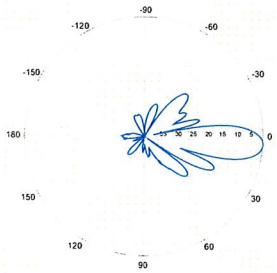
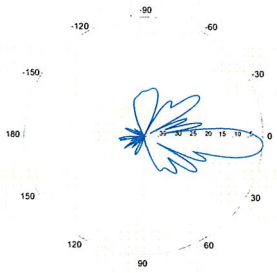


4° | Vertical | 750 MHz



4° | Vertical | 850 MHz

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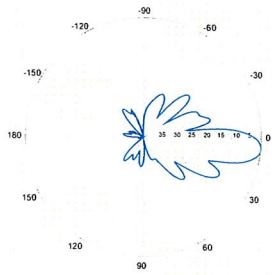
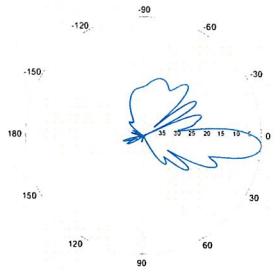


5° | Vertical | 750 MHz



5° | Vertical | 850 MHz

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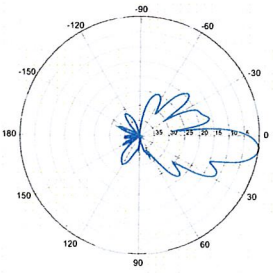
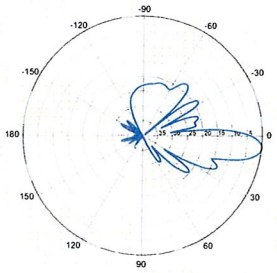
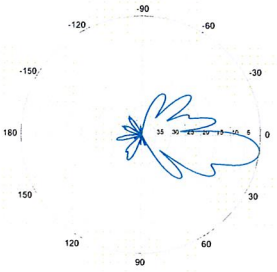


6° | Vertical | 750 MHz

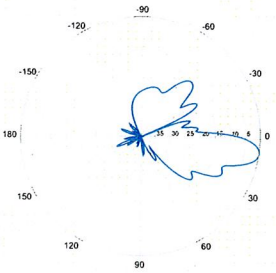


6° | Vertical | 850 MHz

BXA-70063-6CF-EDIN-8



8° | Vertical | 750 MHz



8° | Vertical | 850 MHz

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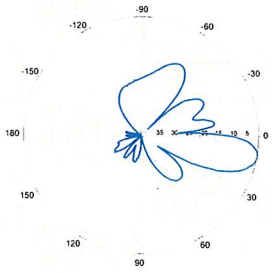
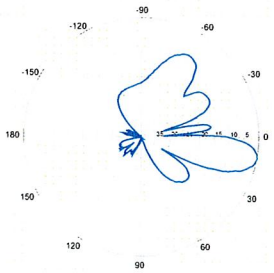


10° | Vertical | 750 MHz



10° | Vertical | 850 MHz

	General	Power	Density					
Site Name: West Hartford								
Tower Height: Verizon @ 147Ft.								
CARRIER	# OF CHAN.	WATTS ERP	HEIGHT	CALC. POWER DENS	FREQ.	MAX. PERMISS. EXP.	FRACTION MPE	Total
*Sprint	11	122	136	0.0261	1945	1.0000	2.61%	
*Sensus (CL&P)	1	200	117	0.0053	940.1125	0.6267	0.84%	
*XM Sat Radio	2	302	160	0.0085	2337.49	1.0000	0.85%	
Verizon PCS	**7**	**268**	**147**	**0.0312**	**1970**	**1.0000**	**3.12%**	
Verizon Cellular	**9**	**373**	**147**	**0.0559**	**869**	**0.5793**	**9.64%**	
Verizon AWS	**1**	**670**	**147**	**0.0111**	**2145**	**1.0000**	**1.11%**	
Verizon 700	**1**	**780**	**147**	**0.0130**	**698**	**0.4653**	**2.79%**	
								20.96%
* Source: Siting Council								

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Waterloo, ON N2K 3T6
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Fax: 519-886-0076
www.p-sec.ca

Specializing in Communication Tower Engineering

April 24, 2012

Veronica Harris, Tower Structural Analyst
Crown Castle USA Inc.
1200 McArthur Blvd
Mahwah, NJ 07430

Subject:	**Structural Analysis Report**	
Carrier Designation:	Carrier Co-Locate:	**Verizon Wireless**
	Carrier Site Number:	**N/A**
	Carrier Site Name:	**West Hartford, CT**
Crown Castle Designation:	Crown Castle BU Number:	**806370**
	Crown Castle Site Name:	**HRT 099 943226**
	Crown Castle JDE Job Number:	**184120**
	Crown Castle WO Number:	**485778**
Engineering Firm Designation:	P-SEC Project Number:	**6488**
Site Data:	**570 NEW PARK AVENUE, WEST HARTFORD, Hartford County, CT** **Latitude *41° 44' 10.5"*, Longitude *-72° 43' 14.2"*** **150-ft VALMONT Monopole**	

Dear Veronica Harris,

Pier Structural Engineering Corp. (P-SEC) is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 460719, in accordance with application 146950, revision 0.

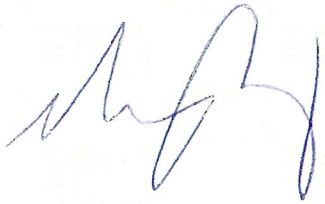
The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC7: Existing + Reserved + Proposed Equipment — **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing/reserved loading, respectively.

The analysis has been performed in accordance with the TIA/EIA-222-F standard, 2005 CT State Building Code and local code requirements based upon a wind speed of 80 mph fastest mile.

We at P-SEC appreciate the opportunity of providing our continuing professional services to you and Crown Castle USA Inc. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:



Martin Piercey, P.E., P.Eng.
CT PE# 25582

tnxTower Report - version 6.0.4.0

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1) INTRODUCTION

This tower is a 150-ft monopole originally designed by VALMONT in May of 1990 for a wind speed of 125 mph per EIA-222-D.

2) ANALYSIS CRITERIA

The following design parameters have been used in our analysis:

Design Standard:		TIA/EIA-222-F standard and 2005 CT Building Code
County/State:		Hartford County, CT
Wind Speeds:	*CASE 1*	80.0 mph (fastest mile)
	CASE 2	28.1 mph (fastest mile) with 1" radial solid ice *(per ASCE7 ice map)*
	CASE 3	50.0 mph (fastest mile) for Serviceability
Allowable Stress:		Increased 1/3rd

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
146	147	6	antel	LPA-80063/6CF	6	1-1/4	1
		2	antel	BXA-171063-12BF			
		3	antel	BXA-70063-6CF-EDIN-5			
		1	antel	BXA-171063-8BF-2			

Notes:
1) Proposed equipment

Table 2 - Existing and Reserved Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
146	147	6	allgon	7130.16	--	--	3
	146	6	decibel	DB948F85T2E-M			
		1	--	Platform Mount [LP 602-1]	12	1-1/4	1
134	134	6	allgon	7185.03	6	1-5/8	1
		1	--	Platform Mount [LP 602-1]			
117	121	1	antel	BCD-87010	1	7/8	2
	117	1	--	Side Arm Mount [SO 701-1]			

Notes:
1) Existing equipment
2) Abandoned equipment
3) Existing equipment to be replaced by proposed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)

Unknown

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	T.E.P., Proj. No. 082233.01 dated 9/3/2008	2308053	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	T.E.P., Proj. No. 082233 dated 8/26/2003	2308022	CCISITES
4-TOWER MANUFACTURER DRAWINGS	Valmont dated 5/22/1990	260794	CCISITES
APPLICATION	Verizon, Revision #0 dated 4/2/2012	146950	CCISITES

3.1) Analysis Method

tnxTower (6.0.4.0), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) When applicable, transmission cables are considered as structural components for calculating wind loads as allowed by TIA/EIA-222-F.

This analysis may be affected if any assumptions are not valid or have been made in error. P-SEC should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary) – LC7

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	150 - 96.8333	Pole	TP39.21x26.19x0.313	1	-9.06	1965.32	30.2	Pass
L2	96.8333 - 48	Pole	TP50.55x37.1963x0.406	2	-19.70	3291.40	38.5	Pass
L3	48 - 0	Pole	TP61.5x48.0228x0.5	3	-38.80	5071.45	40.5	Pass
							Summary	
						Pole (L3)	40.5	Pass
						RATING =	**40.5**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC7

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
2	Anchor Rods	--	35.8	Pass
2	Base Plate	--	26.6	Pass
2	Base Foundation – Soil	--	55.6	Pass
Structure Rating (max from all components) =				**55.6%**

Notes: 1) See full member breakdown and section capacities in Appendix A.
2) See additional documentation in Appendix C for supporting calculations.
3) Stresses up to 105% (steel) and 110% (foundations) are within engineering tolerance and considered acceptable.

4.1) Recommendations

The existing 150-ft monopole located in Hartford County (HRT 099 943226), CT **is structurally acceptable** based on the TIA/EIA-222-F standard, 2005 CT State Building Code and local building code requirements based upon a wind speed of 80 mph fastest mile.

No modifications are required for the proposed loading.

Should you have any questions, please call us anytime at 519-885-3806.

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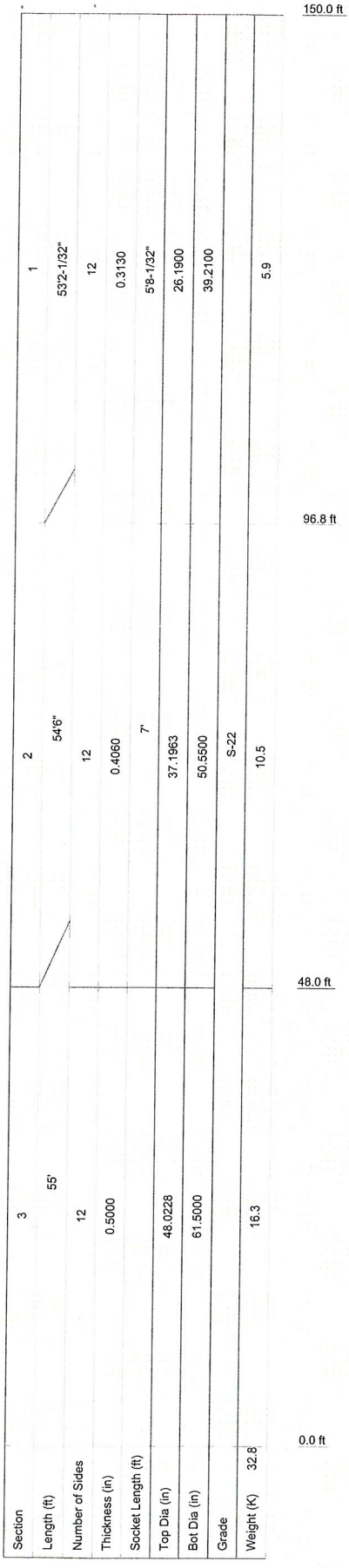
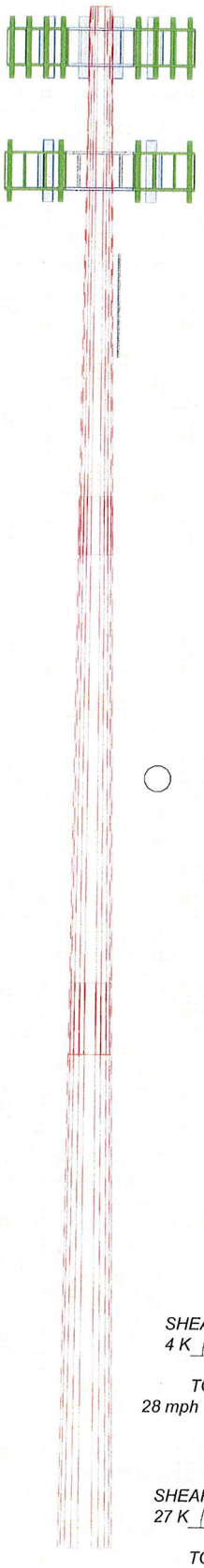
806370-146950 SA Report-20120424.doc

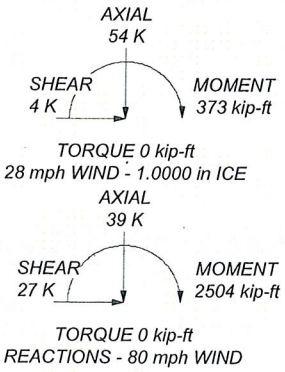
APPENDIX A

TNXTOWER OUTPUT

Section	1	2	3
Length (ft)	53'2-1/32"	54'6"	55'
Number of Sides	12	12	12
Thickness (in)	0.3130	0.4060	0.5000
Socket Length (ft)	5'8-1/32"	7'	
Top Dia (in)	26.1900	37.1963	48.0228
Bot Dia (in)	39.2100	50.5500	61.5000
Grade		S-22	
Weight (K)	5.9	10.5	16.3







DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	146	Platform Mount [LP 602-1] (Carrier 146' E)	146
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	146	(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	146	(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
BXA-171063-12BF w/ Mount Pipe (Carrier 146' P)	146	(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	134
BXA-171063-12BF w/ Mount Pipe (Carrier 146' P)	146	5' x 2" Pipe Mount (Carrier 134' E)	134
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	146	5' x 2" Pipe Mount (Carrier 134' E)	134
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	146	5' x 2" Pipe Mount (Carrier 134' E)	134
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	146	Platform Mount [LP 602-1] (Carrier 134' E)	134
BXA-171063-8BF-2 w/ Mount Pipe (Carrier 146' P)	146	BCD-87010 (Carrier 117' E)	117
		Side Arm Mount [SO 701-1] (Carrier 117' E)	117

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
S-22	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in Hartford County, Connecticut.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 28 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. ----------
6. E - Existing, R/MLA - Reserved, P - Proposed
7. Proposed loading revision at 146ft elevation
8. TOWER RATING: 40.5%

Pier Structural Engineering Corp.
198-55 Northfield Drive East
Waterloo, Ontario N2K 3T6
Phone: (519) 885-3806
FAX: (519) 886-0076
Consulting Engineers

Job: PSEC 6488 (for VERIZON)			
Project: 806370 - HRT 099 943226			
Client: CROWN CASTLE	Drawn by: fchan	App'd:	
Code: TIA/EIA-222-F	Date: 04/24/12	Scale: NTS	
Path: H:\PROJECTS\6488 - CCI - 806370 - HRT 099 943226\806370-LC7-20120424.eri		Dwg No. E-1	

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Hartford County, Connecticut.
Basic wind speed of 80 mph.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 28 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
--.
E - Existing, R/MLA - Reserved, P - Proposed.
Proposed loading revision at 146ft elevation.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
√ Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
√ Leg Bolts Are At Top Of Section
√ Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
Add IBC .6D+W Combination

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
√ Retension Guys To Initial Tension
√ Bypass Mast Stability Checks
√ Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
Autocalc Torque Arm Areas
SR Members Have Cut Ends
Sort Capacity Reports By Component
√ Triangulate Diamond Inner Bracing

Treat Feedline Bundles As Cylinder
Use ASCE 10 X-Brace Ly Rules
√ Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feedline Torque
Include Angle Block Shear Check

Poles
Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets

Tapered Pole Section Geometry

Section	Elevation *ft*	Section Length *ft*	Splice Length *ft*	Number of Sides	Top Diameter *in*	Bottom Diameter *in*	Wall Thickness *in*	Bend Radius *in*	Pole Grade
L1	150'-96'9-31/32"	53'2-1/32"	5'8-1/32"	12	26.1900	39.2100	0.3130	1.2520	S-22 (65 ksi)
L2	96'9-31/32"-48'	54'6"	7'	12	37.1963	50.5500	0.4060	1.6240	S-22 (65 ksi)
L3	48'-0'	55'		12	48.0228	61.5000	0.5000	2.0000	S-22 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	27.1139	26.0804	2229.0917	9.2640	13.5664	164.3095	4516.7441	12.8360	6.1801	19.745
	40.5932	39.2027	7570.6729	13.9251	20.3108	372.7416	15340.2357	19.2944	9.6694	30.893
L2	39.9459	48.0967	8309.3570	13.1709	19.2677	431.2589	16837.0101	23.6717	8.8805	21.873
	52.3332	65.5543	21038.9848	17.9516	26.1849	803.4778	42630.6872	32.2638	12.4593	30.688
L3	51.4927	76.5118	22055.6111	17.0132	24.8758	886.6280	44690.6477	37.6568	11.5301	23.06
	63.6695	98.2100	46644.5955	21.8380	31.8570	1464.1867	94514.5965	48.3360	15.1420	30.284

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
L1 150'-96'9-31/32"				1	1	1		
L2 96'9-31/32"-48'				1	1	1		
L3 48'-0'				1	1	1		

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
1-1/4" Line (Carrier 146' E)	B	No	Inside Pole	146' - 0'	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
1-1/4" Line (Carrier 146' P)	B	No	Inside Pole	146' - 0'	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
						2" Ice	0.00	0.66
						4" Ice	0.00	0.66
**								
1-5/8" Line (Carrier 134' E)	C	No	Inside Pole	134' - 0'	6	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
						2" Ice	0.00	0.82
						4" Ice	0.00	0.82
**								
7/8" Line (Carrier 117' E)	C	No	Inside Pole	117' - 0'	1	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
						2" Ice	0.00	0.33
						4" Ice	0.00	0.33
****								

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.58 11.24 11.87 13.16 15.87	10.67 11.93 12.91 14.92 19.16	0.05 0.14 0.24 0.48 1.09
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.58 11.24 11.87 13.16 15.87	10.67 11.93 12.91 14.92 19.16	0.05 0.14 0.24 0.48 1.09
(2) LPA-80063/6CF w/ Mount Pipe (Carrier 146' P)	C	From Leg	4.00 0' 3'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	10.58 11.24 11.87 13.16 15.87	10.67 11.93 12.91 14.92 19.16	0.05 0.14 0.24 0.48 1.09
BXA-171063-12BF w/ Mount Pipe (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.97 5.52 6.04 7.09 9.36	5.23 6.39 7.26 9.05 12.82	0.04 0.08 0.14 0.27 0.67
BXA-171063-12BF w/ Mount Pipe (Carrier 146' P)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	4.97 5.52 6.04 7.09 9.36	5.23 6.39 7.26 9.05 12.82	0.04 0.08 0.14 0.27 0.67
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	B	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
BXA-70063-6CF-EDIN-5 w/ Mount Pipe (Carrier 146' P)	C	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	7.97 8.61 9.22 10.46 13.07	5.80 6.95 7.82 9.60 13.37	0.04 0.10 0.17 0.34 0.80
BXA-171063-8BF-2 w/ Mount Pipe (Carrier 146' P)	A	From Leg	4.00 0' 1'	0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.18 3.56 3.96 4.85 6.77	3.35 3.97 4.60 5.89 8.89	0.03 0.06 0.10 0.19 0.49
Platform Mount [LP 602-1] (Carrier 146' E)	C	None		0.0000	146'	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	32.03 38.71 45.39 58.75 85.47	32.03 38.71 45.39 58.75 85.47	1.34 1.80 2.26 3.17 5.00
**									
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	A	From Leg	4.00 0' 0'	0.0000	134'	No Ice 1/2" Ice 1" Ice	4.21 4.59 4.99	1.86 2.36 2.87	0.03 0.05 0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft Vert ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	B	From Leg	4.00 0' 0'	0.0000	134'	2" Ice	5.82	3.95	0.17
						4" Ice	7.64	6.48	0.44
						No Ice	4.21	1.86	0.03
						1/2" Ice	4.59	2.36	0.05
						1" Ice	4.99	2.87	0.09
						2" Ice	5.82	3.95	0.17
						4" Ice	7.64	6.48	0.44
(2) 7185.03 w/ Mount Pipe (Carrier 134' E)	C	From Leg	4.00 0' 0'	0.0000	134'	No Ice	4.21	1.86	0.03
						1/2" Ice	4.59	2.36	0.05
						1" Ice	4.99	2.87	0.09
						2" Ice	5.82	3.95	0.17
						4" Ice	7.64	6.48	0.44
5' x 2" Pipe Mount (Carrier 134' E)	A	From Leg	4.00 0' 0'	0.0000	134'	No Ice	1.00	1.00	0.03
						1/2" Ice	1.39	1.39	0.04
						1" Ice	1.70	1.70	0.05
						2" Ice	2.35	2.35	0.08
						4" Ice	3.78	3.78	0.20
5' x 2" Pipe Mount (Carrier 134' E)	B	From Leg	4.00 0' 0'	0.0000	134'	No Ice	1.00	1.00	0.03
						1/2" Ice	1.39	1.39	0.04
						1" Ice	1.70	1.70	0.05
						2" Ice	2.35	2.35	0.08
						4" Ice	3.78	3.78	0.20
5' x 2" Pipe Mount (Carrier 134' E)	C	From Leg	4.00 0' 0'	0.0000	134'	No Ice	1.00	1.00	0.03
						1/2" Ice	1.39	1.39	0.04
						1" Ice	1.70	1.70	0.05
						2" Ice	2.35	2.35	0.08
						4" Ice	3.78	3.78	0.20
Platform Mount [LP 602-1] (Carrier 134' E)	C	None		0.0000	134'	No Ice	32.03	32.03	1.34
						1/2" Ice	38.71	38.71	1.80
						1" Ice	45.39	45.39	2.26
						2" Ice	58.75	58.75	3.17
						4" Ice	85.47	85.47	5.00
**									
BCD-87010 (Carrier 117' E)	A	From Leg	3.00 0' 4'	0.0000	117'	No Ice	2.90	2.90	0.03
						1/2" Ice	4.05	4.05	0.05
						1" Ice	5.21	5.21	0.08
						2" Ice	7.01	7.01	0.16
						4" Ice	9.85	9.85	0.41
Side Arm Mount [SO 701-1] (Carrier 117' E)	A	From Leg	1.50 0' 0'	0.0000	117'	No Ice	0.85	1.67	0.07
						1/2" Ice	1.14	2.34	0.08
						1" Ice	1.43	3.01	0.09
						2" Ice	2.01	4.35	0.12
						4" Ice	3.17	7.03	0.18
****									

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	150 - 96.8333	Pole	Max Tension	36	0.00	-0.00	0.00
			Max. Compression	14	-16.83	0.00	0.44
			Max. Mx	5	-9.06	-445.66	0.26
			Max. My	2	-9.06	0.01	445.62

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	5	13.42	-445.66	0.26
			Max. Vx	2	-13.39	0.01	445.62
			Max. Torque	11			0.42
L2	96.8333 - 48	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-30.64	0.00	0.44
			Max. Mx	5	-19.70	-1229.60	0.27
			Max. My	2	-19.70	0.01	1228.17
			Max. Vy	5	19.63	-1229.60	0.27
			Max. Vx	2	-19.60	0.01	1228.17
			Max. Torque	5			0.29
L3	48 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-53.81	0.00	0.44
			Max. Mx	5	-38.80	-2503.60	0.27
			Max. My	2	-38.80	0.01	2500.55
			Max. Vy	5	26.74	-2503.60	0.27
			Max. Vx	2	-26.71	0.01	2500.55
			Max. Torque	5			0.29

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	14	53.81	0.00	0.00
	Max. H_x	11	38.81	26.73	0.00
	Max. H_z	2	38.81	0.00	26.70
	Max. M_x	2	2500.55	0.00	26.70
	Max. M_z	5	2503.60	-26.73	-0.00
	Max. Torsion	5	0.29	-26.73	-0.00
	Min. Vert	11	38.81	26.73	0.00
	Min. H_x	5	38.81	-26.73	-0.00
	Min. H_z	8	38.81	-0.00	-26.70
	Min. M_x	8	-2499.99	-0.00	-26.70
	Min. M_z	11	-2503.60	26.73	0.00
	Min. Torsion	11	-0.29	26.73	0.00

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	150 - 96.8333	14.196	36	0.8166	0.0002
L2	102.5 - 48	6.715	36	0.6244	0.0002
L3	55 - 0	1.915	36	0.3172	0.0001

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
146'	(2) LPA-80063/6CF w/ Mount Pipe	36	13.523	0.8032	0.0002	82651
134'	(2) 7185.03 w/ Mount Pipe	36	11.521	0.7616	0.0002	25828
117'	BCD-87010	36	8.812	0.6948	0.0002	12522

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	53'2-1/32'	0'	0.0	39.000	37.8041	-9.06	1474.36	0.006
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	54'6"	0'	0.0	39.000	63.3120	-19.70	2469.17	0.008
L3	48 - 0 (3)	TP61.5x48.0228x0.5	55'	0'	0.0	38.739	98.2100	-38.80	3804.54	0.010

Pole Bending Design Data

Section No.	Elevation ft	Size	Actual M_x kip-ft	Actual f_{bx} ksi	Allow. F_{bx} ksi	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y kip-ft	Actual f_{by} ksi	Allow. F_{by} ksi	Ratio $\frac{f_{by}}{F_{by}}$
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	445.74	-15.436	39.000	0.396	0.00	0.000	39.000	0.000
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	1229.61	-19.694	39.000	0.505	0.00	0.000	39.000	0.000
L3	48 - 0 (3)	TP61.5x48.0228x0.5	2503.60	-20.519	38.739	0.530	0.00	0.000	38.739	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	150 - 96.8333 (1)	TP39.21x26.19x0.313	0.006	0.396	0.000	0.402 ✓	1.333	H1-3 ✓
L2	96.8333 - 48 (2)	TP50.55x37.1963x0.406	0.008	0.505	0.000	0.513 ✓	1.333	H1-3 ✓
L3	48 - 0 (3)	TP61.5x48.0228x0.5	0.010	0.530	0.000	0.540 ✓	1.333	H1-3 ✓

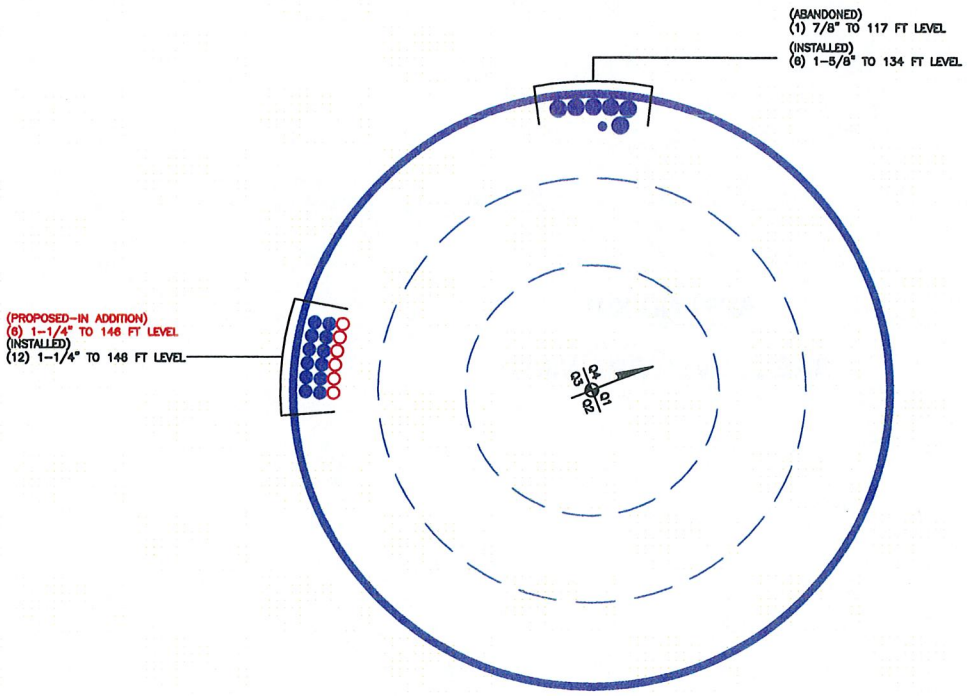
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	150 - 96.8333	Pole	TP39.21x26.19x0.313	1	-9.06	1965.32	30.2	Pass
L2	96.8333 - 48	Pole	TP50.55x37.1963x0.406	2	-19.70	3291.40	38.5	Pass
L3	48 - 0	Pole	TP61.5x48.0228x0.5	3	-38.80	5071.45	40.5	Pass
							Summary	
						Pole (L3)	40.5	Pass
						RATING =	**40.5**	**Pass**

APPENDIX B

BASE LEVEL DRAWING

TX LINE LAYOUT



BUSINESS UNIT: 806370 TOWER ID: C_BASELEVEL

Client

CROWN CASTLE

Professional Stamp

Revisions

No.	Description	Date
A	ISSUED FOR REVIEW	04.24.12

Engineering Firm

P-SEC
ph: 519-885-3806
fx: 519-886-0076
www.p-sec.ca
PIER STRUCTURAL ENGINEERING CORP
55 NORTHFIELD DR. E, SUITE 198
WATERLOO, ON N2K 3T6

PSEC Job No.

6488

Site Name

806370
HRT 099 943226

Site Design

Sheet Title

TX LINES

Drawn by	FC	Sheet
Checked by		A-1
Approved By		

APPENDIX C

ADDITIONAL CALCULATIONS

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev F

Site Data

BU#: *806370*
Site Name: *HRT 099 943226*
App #: *146950 rev.0*

Pole Manufacturer:	*Other*

Reactions		
Moment:	2504	ft-kips
Axial:	39	kips
Shear:	27	kips

If No stiffeners, Criteria:	AISC ASD	<-Only Applcable to Unstiffened Cases

Anchor Rod Data		
Qty:	24	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	70.17	in

Anchor Rod Results

		Rigid
Maximum Rod Tension:	69.7 Kips	Service, ASD
Allowable Tension:	195.0 Kips	Fty*ASIF
Anchor Rod Stress Ratio:	35.8% **Pass**	

Plate Data		
Diam:	76.17	in
Thick:	3	in
Grade:	60	ksi
Single-Rod B-eff:	8.24	in

Base Plate Results

	Flexural Check	Rigid
Base Plate Stress:	16.0 ksi	Service ASD
Allowable Plate Stress:	60.0 ksi	0.75*Fy*ASIF
Base Plate Stress Ratio:	26.6% **Pass**	Y.L. Length: 33.79

Stiffener Data (Welding at both sides)		
Config:	0	*
Weld Type:		
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

n/a

Stiffener Results

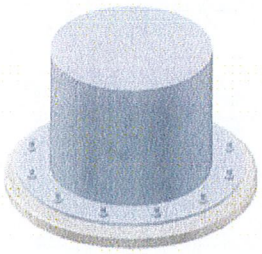
Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a

Pole Data		
Diam:	61.5	in
Thick:	0.5	in
Grade:	65	ksi
# of Sides:	12	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	



* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Equivalent Silty Soil Parameter Tool

Note:
This tool determines the equivalent soil parameters for silty soil (having both cohesion and angle of friction), according to the CCI Foundations ongoing discussions (2010), Criteria Item DS-7 . The equivalent parameters results are to be input in the PLS-Caisson Software to account for the combined resistance of the granular and cohesive parameters simultaneously present in silty and similar soils

Site Data

BU#: *806370*
Site Name: *HRT 099 943226*
App #: *146950 rev.0*

Neglect Top Layer: Y Y/N
# of Layers: 6

Input the data in the "shaded" columns. If soil layer is submerged, then enter the saturated density (buoyant unit weight)

Layer:	Layer length (ft)	From (ft)	To (ft)	Unit weight of soil (pcf)	Cohesion (psf)	Internal Friction Angle (deg)	K_p	Depth to Mid-Layer (ft)	Overburden (psf)	Sand Resistance (ksf)	Clay Resistance (ksf)	P_p total (ksf)	Equivalent Parameters for PLS Caisson Input: Equivalent Cohesion (psf)	Equivalent K_p
1	5	0	5	100	300	30	3.000	2.5	250	0.000	0.00	0.000	**0**	**0.00**
2	5	5	10	100	300	30	3.000	7.5	750	6.750	2.40	9.150	**1144**	**4.07**
3	4	10	14	100	300	30	3.000	12	1200	10.800	2.40	13.200	**1650**	**3.67**
4	5	14	19	36	100	23	2.283	16.5	1490	10.203	0.80	11.003	**1375**	**2.46**
5	5	19	24	36	100	23	2.283	21.5	1670	11.436	0.80	12.236	**1529**	**2.44**
6	5	24	29	36	100	23	2.283	26.5	1850	12.669	0.80	13.469	**1684**	**2.43**

Calculation Notes:
1- Sand Resistance = 3 * Kp * Overburden ----> (Per equations used in PLS-Caisson Software)
2- Cohesion Resistance = 8 * C ----------> (Per equations used in PLS-Caisson Software, Full 8CD approach)
3- Total Resistance = Sand Resistance + Cohesion Resistance
4- Equivalent Kp= Total / Overburden / 3
5- Equivalent C= Total / 8

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*****************************************************************************
*                                                                           *
*  PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.*
*                                                                           *
*****************************************************************************
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*** ANALYSIS IDENTIFICATION : 108" Caisson (9')
NOTES : 806370 - HRT 099 943226

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 4.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 9.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.00

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	S	5.00	0.00	100.0		1.000	-0.00
2	S	5.00	5.00	100.0		4.070	37.27
3	S	4.00	10.00	100.0		3.670	34.87
4	S	5.00	14.00	36.0		2.460	24.96
5	S	5.00	19.00	36.0		2.440	24.75
6	S	5.00	24.00	36.0		2.430	24.64

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 2504.0 VERTICAL (k) = 39.0 SHEAR (k) = 27.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 2.00

*** CALCULATED PIER LENGTH (ft) = 20.500 <<< 25.0FT DESIGN PIER LENGTH [OK]

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
S	0.00	5.00	100.0		1.000	33.75	3.33
S	5.00	5.00	100.0		4.070	412.09	7.78
S	10.00	3.21	100.0		3.670	368.98	11.68
S	13.21	0.79	100.0		3.670	-106.65	13.61
S	14.00	5.00	36.0		2.460	-494.83	16.55
S	19.00	1.50	36.0		2.440	-158.80	19.75

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	54.5	5151.1	27.3	2575.6
2.05	48.9	5259.1	24.4	2629.5
4.10	31.8	5343.7	15.9	2671.9
6.15	-49.7	5352.4	-24.8	2676.2
8.20	-211.3	5092.8	-105.6	2546.4
10.25	-416.4	4454.9	-208.2	2227.4
12.30	-645.4	3373.6	-322.7	1686.8
14.35	-620.9	1952.7	-310.5	976.4
16.40	-423.6	880.4	-211.8	440.2
18.45	-216.2	222.9	-108.1	111.5
20.50	0.0	-0.0	0.0	-0.0

*** TOTAL REINFORCEMENT PCT = 0.46 REINFORCEMENT AREA (in^2) = 42.14
*** USABLE AXIAL CAP. (k) = 39.0 USABLE MOMENT CAP. (ft-k) = 8510.1

*** US Standard Re-Bars (Select one of the following):

211	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in)	AT SPACING (in) =	1.46
136	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in)	AT SPACING (in) =	2.26
96	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in)	AT SPACING (in) =	3.21
71	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in)	AT SPACING (in) =	4.34
54	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in)	AT SPACING (in) =	5.70
43	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in)	AT SPACING (in) =	7.16
34	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in)	AT SPACING (in) =	9.06
28	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in)	AT SPACING (in) =	11.00
19	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in)	AT SPACING (in) =	16.20

*** WEIGHT OF CAISSON (kips) = 195.623
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 613.0

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PIER FOUNDATIONS ANALYSIS AND DESIGN - (C) 1995,2002 POWER LINE SYSTEMS, INC.

*** ANALYSIS IDENTIFICATION : 108" Caisson (9')
NOTES : 806370 - HRT 099 943226

*** PIER PROPERTIES CONCRETE STRENGTH (ksi) = 4.00 STEEL STRENGTH (ksi) = 60.00

DIAMETER (ft) = 9.000 DISTANCE FROM TOP OF PIER TO GROUND LEVEL (ft) = 0.00

*** SOIL PROPERTIES

LAYER	TYPE	THICKNESS (ft)	DEPTH AT TOP OF LAYER (ft)	DENSITY (pcf)	CU (psf)	KP	PHI (degrees)
1	S	5.00	0.00	100.0		1.000	-0.00
2	S	5.00	5.00	100.0		4.070	37.27
3	S	4.00	10.00	100.0		3.670	34.87
4	S	5.00	14.00	36.0		2.460	24.96
5	S	5.00	19.00	36.0		2.440	24.75
6	S	5.00	24.00	36.0		2.430	24.64

*** DESIGN (FACTORED) LOADS AT TOP OF PIER MOMENT (ft-k) = 4500.0 VERTICAL (k) = 70.0 SHEAR (k) = 40.0
ADDITIONAL SAFETY FACTOR AGAINST SOIL FAILURE = 2.00

*** CALCULATED PIER LENGTH (ft) = 25.000

*** CHECK OF SOILS PROPERTIES AND ULTIMATE RESISTING FORCES ALONG PIER

TYPE	TOP OF LAYER BELOW TOP OF PIER (ft)	THICKNESS (ft)	DENSITY (pcf)	CU (psf)	KP	FORCE (k)	ARM (ft)
S	0.00	5.00	100.0		1.000	33.75	3.33
S	5.00	5.00	100.0		4.070	412.09	7.78
S	10.00	4.00	100.0		3.670	475.63	12.11
S	14.00	1.69	36.0		2.460	160.42	14.85
S	15.69	3.31	36.0		2.460	-334.41	17.37
S	19.00	5.00	36.0		2.440	-550.10	21.54
S	24.00	1.00	36.0		2.430	-116.65	24.50

*** SHEAR AND MOMENTS ALONG PIER

DISTANCE BELOW TOP OF PIER (ft)	WITH THE ADDITIONAL SAFETY FACTOR SHEAR (k)	WITH THE ADDITIONAL SAFETY FACTOR MOMENT (ft-k)	WITHOUT ADDITIONAL SAFETY FACTOR SHEAR (k)	WITHOUT ADDITIONAL SAFETY FACTOR MOMENT (ft-k)
0.00	80.7	9057.1	40.4	4528.6
2.50	72.3	9251.9	36.1	4626.0
5.00	47.0	9404.5	23.5	4702.2
7.50	-124.7	9321.6	-62.4	4660.8
10.00	-365.1	8723.6	-182.6	4361.8
12.50	-643.8	7475.3	-321.9	3737.7
15.00	-934.9	5477.1	-467.5	2738.5
17.50	-821.5	3158.6	-410.7	1579.3
20.00	-561.5	1427.4	-280.7	713.7
22.50	-287.9	362.6	-144.0	181.3
25.00	0.5	0.2	0.2	0.1

*** TOTAL REINFORCEMENT PCT = 0.44 REINFORCEMENT AREA (in^2) = 40.31
*** USABLE AXIAL CAP. (k) = 70.0 USABLE MOMENT CAP. (ft-k) = 8283.8

*** US Standard Re-Bars (Select one of the following):

202	BARS #4	(AREA = 0.20 in^2	DIA = 0.500 in) AT SPACING (in) =	1.52
131	BARS #5	(AREA = 0.31 in^2	DIA = 0.625 in) AT SPACING (in) =	2.35
92	BARS #6	(AREA = 0.44 in^2	DIA = 0.750 in) AT SPACING (in) =	3.35
68	BARS #7	(AREA = 0.60 in^2	DIA = 0.875 in) AT SPACING (in) =	4.53
52	BARS #8	(AREA = 0.79 in^2	DIA = 1.000 in) AT SPACING (in) =	5.92
41	BARS #9	(AREA = 1.00 in^2	DIA = 1.128 in) AT SPACING (in) =	7.51
32	BARS #10	(AREA = 1.27 in^2	DIA = 1.270 in) AT SPACING (in) =	9.62
26	BARS #11	(AREA = 1.56 in^2	DIA = 1.410 in) AT SPACING (in) =	11.84
18	BARS #14	(AREA = 2.25 in^2	DIA = 1.693 in) AT SPACING (in) =	17.10

*** WEIGHT OF CAISSON (kips) = 238.565
*** PRESSURE UNDER CAISSON DUE TO INPUT DESIGN AXIAL LOAD (psf) = 1100.3

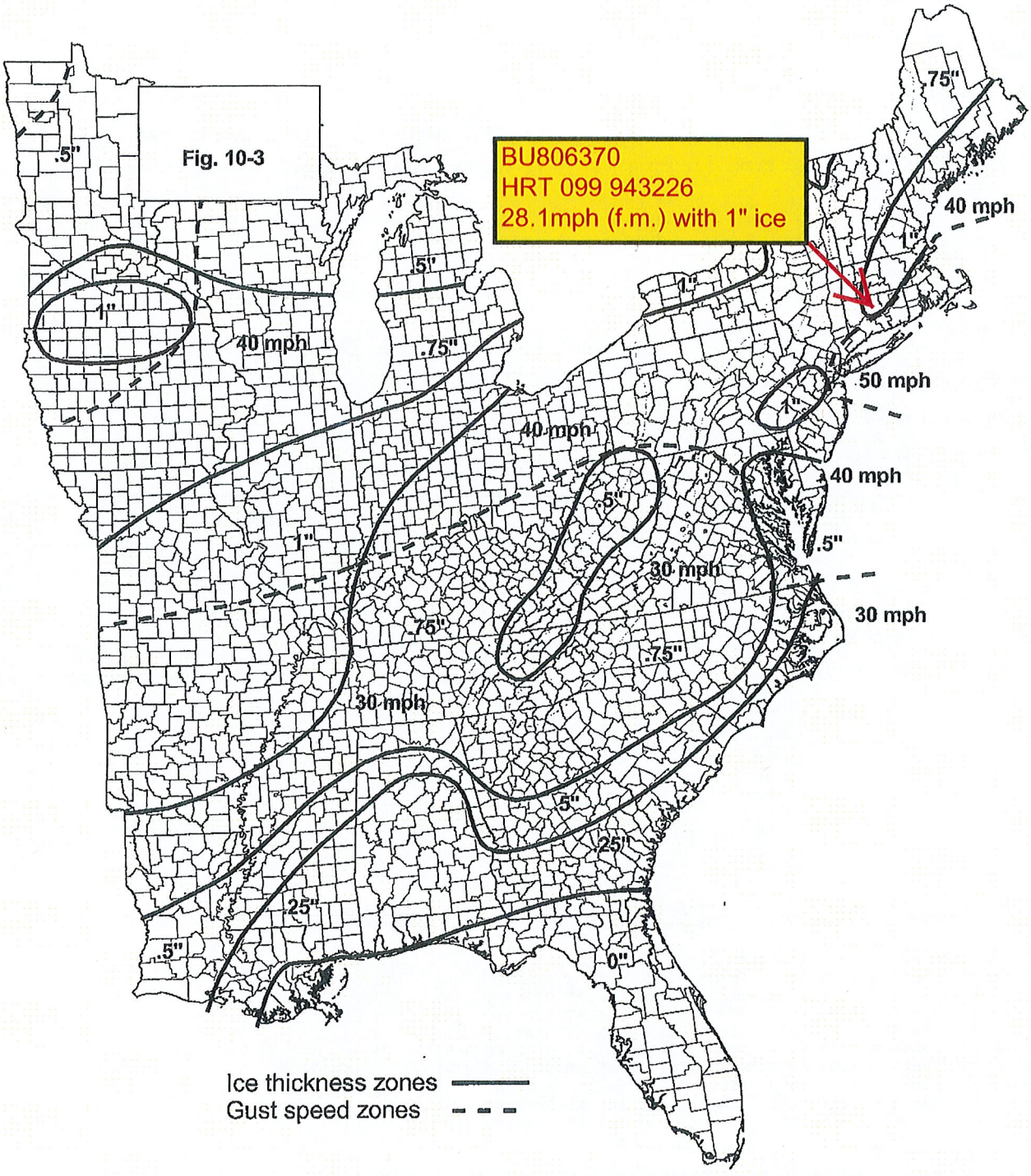

FIGURE 10-2 (continued) 50-YEAR MEAN RECURRENCE INTERVAL UNIFORM ICE THICKNESSES DUE TO FREEZING RAIN WITH CONCURRENT 3-SECOND GUST SPEEDS: CONTIGUOUS 48 STATES.